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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/588,369	10/16/2007	Uri Banin	BANIN4B	9217
1444	7590	06/22/2011	EXAMINER	
Browdy and Neimark, PLLC 1625 K Street, N.W. Suite 1100 Washington, DC 20006			DULKA, JOHN P	
			ART UNIT	PAPER NUMBER
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/588,369	<b>Applicant(s)</b> BANIN ET AL.	
	<b>Examiner</b> JOHN P. DULKA	<b>Art Unit</b> 2895	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 26 March 2010.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 59-62, 65, 67-74, 81-84, 86 and 89-91 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 59-62, 65, 67-74, 81-84, 86 and 89-91 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 August 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Drafts, Person's Patent Drawing, Review (PTO-948)                    | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 17 February, 2010 has been entered. Examiner notes the RCE is filed on 26 March, 2010.

### ***Status of Application***

Examiner notes changes to claims as per amendment filed 17 February, 2010. Pending claims 59-62, 65, 67-74, 81-84, 86 and 89-91 are rejected below in final office action.

### ***Claim Objections***

Claim 65 as filed 17 February, 2010 is objected to because of the following informalities: there appears to be an extra space between "nanostructure" and "according".

Claims 83 and 84 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Parent claims 59 and 82 of dependent claims 83 and 84 appear to already have the elongated structure with nanozones attached to end portions as per

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claim 59/82. Claims 83 and 84 appear redundant with respect to claims 59 and 82 because the nanostructures in the solution of claim 82 are of a structure as defined in claim 59.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 59-62, 81-84, 86 and 90 are rejected under 35 U.S.C. 102(e) as being anticipated by Natan et al. in U.S. Patent 7,225,082 B1.

In re claim 59, Natan anticipates; a nanostructure **nanorods-Fig. 1a-col. 5 ln. 9-13** having at least one elongated structure element of a first material **B-segment-Fig. 1a-col. 6 ln. 40-45**, said elongated structure element being 100nm in length or less **B-segment-10nm-Fig. 1a-col. 8 ln. 28-31** and having

at least two end portions **as illustrated in Fig. 1a segment B has two end portions**, each end portion being coupled to a corresponding nanozone **A and B-segments-Fig. 1a-col. 6 ln. 40-45**

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and each of said nanozones being of a second material that differs from said first material in at least one property selected from electrical conductivity, chemical reactivity and composition **as stated in col. 7 ln. 18-25 each segment is different material.**

In re claim 60, Natan anticipates; wherein the second material is a metal or metal alloy **as anticipated by statements in col. 7 ln. 56-col. 8 ln. 10 - the segments may be metal.**

In re claim 61, Natan anticipates; wherein the second material is a conductive polymer or an insulating material **as anticipated by statements in col. 7 ln. 56-col. 8 ln. 23 - the segments may be polymers and polymers with metal.**

In re claim 62, Natan anticipates; wherein the second material is a semiconductor material **as anticipated by statements in col. 7 ln. 56-col. 8 ln. 10 - the segments may be semiconductor.**

In re claim 81, Natan anticipates; a self assembled construct, comprising a plurality of nanostructures according to claim 59 **as stated in col. 10 ln. 51-67 there is both a solution and also self-assembled**, wherein each nanostructure is optionally linked to another nanostructure in the construct through its conductive zone **as stated in col. 7 ln. 14-35 there may be a plurality of segments together, wherein the conductive zone would be the segment between other segments.**

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In re claim 82, Natan anticipates; a solution comprising a plurality of nanostructures according to claim 59 **as stated in col. 10 ln. 51-67 there is a solution holding the nanorods made of segments.**

In re claim 83, Natan anticipates; the solution according to claim 82, wherein each of said nanostructures has an elongated structure element comprising at least two end portions, each being coupled to a nanozone **as stated in col. 7 ln. 14-35 there are a plurality of segments attached together similar to Fig. 1a.**

In re claim 84, Natan anticipates; the solution according to claim 83, wherein said elongated structure has two end portions, each being coupled to a nanozone **refer to claim 83 rejection.**

In re claim 86, Natan anticipates; wherein each of the end portions of said elongated structure is coupled to a nanozone **as stated in col. 7 ln. 14-35 there are a plurality of segments attached together similar to Fig. 1a. The two ends of segment B are coupled to other segments etc....**

In re claim 90, Natan anticipates; wherein said first material is selected from the group consisting of a semiconductor material, an insulating material, a metal and a combination thereof **as anticipated by statements in col. 7 ln. 56-col. 8 ln. 10 - the segments may be metal.**

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Claims 68-71, 73 and 74 are rejected under 35 U.S.C. 102(b) as being anticipated by Banin in WO 03/097904 A1.

In re claim 68, Banin anticipates; a method for forming a nanostructure having at least one elongated portion, of a first material **(InAs nanorods) Fig. 1 pg. 13 ln. 9-10**, and a nanozone of a second material on at least one of its end portions **(M is Au catalyst) Fig. 1 pg. 13 ln. 11**, said first and second materials being different in at least one property selected from electrical conductivity, chemical reactivity and composition **(semiconductor versus metal) Fig. 1**, said method comprising:

providing a solution of nanostructures, each nanostructure having composed of at least one elongated structure element of a first material **(pg. 12-13 and pg. 8 letter (a))**;

contacting said nanostructures in solution with an agent of a second material, said agent being selected from a metal source, a metal alloy source, a conductive polymer source, an insulating material source and a semiconductor source **(pg. 12-13 and pg. 8 letter (a)—metal source)**; and

allowing growth of said at least one agent of a second material on at least one end portion of the elongated portion of each of said nanostructures, to thereby obtain nanostructures, bearing at least one nanozone on at least one end portion of said at least one elongated structure **(pg. 8 letters a-c and Fig. 1-2 pg. 13-15)**.

In re claim 69, Banin anticipates; wherein said agent is selected from a metal source and a metal alloy source **(pg. 12-13 and pg. 8 letter (a)—metal source)**.

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In re claim 70, Banin anticipates; the method according to claim 68, wherein said first material is selected from a semiconductor material **(InAs nanorods) Fig. 1 pg. 13 ln. 9-10**, an insulating material, a metal and a combination thereof.

In re claim 71, Banin anticipates; wherein said first material is a semiconductor material **(InAs nanorods) Fig. 1 pg. 13 ln. 9-10**.

In re claim 73, Banin anticipates; a method for forming an electrically conductive zone on a nanostructure having at least one elongated, said method comprising:

providing an organic solution of semiconductor nanostructures **pg. 8--letter (a) and point (i)**, each nanostructure having at least one elongated structure element **(InAs nanorods) Fig. 1 pg. 13 ln. 9-10**;

contacting said nanostructure in said organic solution with another organic solution comprising a metal or metal alloy source **pg. 8--letter (a) there is a metal source**, a stabilizer and/or a surfactant and/or electron donor **in pg 13 ln. 17 there is a reducing agent and in pg. 16 ln. 5-10 there may be a surfactant**; and

allowing growth of said metal or metal alloy on at least one end portion of the elongated portion of each of said semiconductor nanostructures, to thereby obtain semiconductor nanostructures, bearing at least one electrically conductive nanozone of metal or metal alloy on said at least one end portion of said at least one elongated structure **(pg. 8 letters a-c and Fig. 1-2 pg. 13-15)**.



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In re claim 74, Banin anticipates; the method according to claim 73, wherein said nanostructure is in a form selected from a nanorod, a bipod, a tripod, a tetrapod, a nanowire and a nanotube **throughout specification: nanorod.**

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 65, 67, 89, and 91 are rejected under 35 U.S.C. 103(a) as being unpatentable over Natan in view of Majumdar et al. in U.S. Application Publication 2002/0175408A1.

Natan teaches of creating a nanostructure with different rod-like segments of less than 100nm such that the different rod-like segments may each be made of different material. Natan further teaches that the different segments may be made of any material, but does not explicitly state compound semiconductors.

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However in re claim 65, Majumdar teaches; wherein said first and second materials are each a semiconductor material selected from Group II-VI semiconductors, Group III-V semiconductors, Group IV-VI semiconductors, Group IV semiconductors, alloys made of these semiconductors, combinations of the semiconductors in composite structures and core/shell structures of the above semiconductors **as stated in pg. 5 ¶. 0078 the semiconductor material used in the nanostructures may be II-VI therefore including CdSe. Throughout Majumdar teaches of SiGe also. Examiner further notes that Natan mentions CdSe for segments in col. 37 ln. 60-67.**

In re claim 67, Majumdar teaches; wherein said first material is CdSe or CdSe/ZnS in a core/shell layered arrangement and said second material is gold **as stated in Fig. 25 pg. 12 ¶. 0146 number 204 defines the tip of elongated nanostructure number 206 and consists of Au/gold alloy. A very similar structure of Fig. 24 pg. 11-12 ¶. 0144 number 188 defines the tip of elongated nanostructure number 194 and consists of Au/gold alloy. Additionally in Fig. 25 pg. 12 ¶. 0146 number 206 is a semiconductor material. Furthermore as stated in pg. 5 ¶. 0078 the semiconductor material used in the nanostructures may be II-VI therefore including CdSe. There exists a difference in composition, electrical conductivity and chemical reactivity between the metal Au and the Si/SiGe materials. Examiner also notes that Natan in teaches of segments comprising gold in col. 7 ln. 65-67 and segments comprising CdSe in col. 37 ln. 60-67.**

It would have been obvious to one having ordinary skill in the art at the time the invention was made to recognize that combining Majumdar's invention with Natan's invention

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would have been beneficial, as stated throughout Majumdar, in order to use the nanorods as current carrying devices.

In re claim 89, Majumdar teaches; the nanostructure according to claim 59 being selected from a bipod, a tripod and a tetrapod **as depicted in Fig. 35 pg. 15 ¶. 0189 there is a three prong device.**

It would have been obvious to one having ordinary skill in the art at the time the invention was made to recognize that combining Majumdar's invention with Natan's invention would have been beneficial, as stated throughout Majumdar, in order to form a three terminal electronic devices.

In re claim 91, Majumdar teaches; wherein said Group II-VI semiconductors are alloys selected from the group consisting of CdSe, CdS, CdTe, ZnSe, ZnS, ZnTe, and combination thereof **as stated in pg. 5 ¶. 0078 the semiconductor material used in the nanostructures may be II-VI therefore including CdSe. Examiner further notes that Natan mentions CdSe for segments in col. 37 ln. 60-67.**

It would have been obvious to one having ordinary skill in the art at the time the invention was made to recognize that combining Majumdar's invention with Natan's invention would have been beneficial, as stated throughout Majumdar, in order to use the nanorods as current carrying devices.

Claim 72 is rejected under 35 U.S.C. 103(a) as being unpatentable over Banin in view of Majumdar et al. in U.S. Application Publication 2002/0175408 A1.

Banin teaches of forming a straight nanorod using a solution with a metal source. Banin does not explicitly disclose other shapes of nanorods.

In re claim 72, Majumdar teaches; wherein said nanostructure is selected from a bipod, a tripod and a tetrapod **Fig. 34/35 pg. 15 ¶. 0189. Furthermore it would have been obvious to one having ordinary skill in the art at the time the invention was made for Banin to use any shaded rod.**

It would have been obvious to one having ordinary skill in the art at the time the invention was made to recognize that combining Majumdar's invention with Natan's invention would have been beneficial, as stated throughout Majumdar, in order to form three terminal electronic devices.

### ***Response to Arguments***

As per applicant's main thesis in pg. 9-10 arguments filed 17 February, 2011 with respect to the method claims may be summarized by the quote, "It would be well appreciated by one of ordinary skill in the art that Banin's method relied upon by the examiner does not permit the formation of a rod having **both ends** bonded to nanozones of a different material". Examiner is persuaded by applicant's remarks that the Banin reference with respect to the method does not enable both ends to be bonded to nanozones (persuaded by both remarks filed 26 March 2010 and 17 February, 2010). However the claims, specifically 68 and 73 only require one end and do

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not require both ends. Therefore the applicant is arguing a moot point because the point being argued is not in the claims: In response to the Applicant's argument that the Banin reference is not valid with respect to both ends does not include features of Applicant's invention, the limitations on which the Applicant relies (i.e., nanozone on both ends) are not stated on the claims. It is the claims that define the claimed invention, and it is the claims, not specifications that are anticipated or unpatentable. *Constant v. Advanced Micro-Devices Inc.*, 7 USPQ 2d.

As per applicant's main thesis in pg. 3-4 arguments filed 26 March, 2011 with respect to the method claim 68. The applicant states that claim 68 does not need to be further limited by both sides because the prior art Banin reference starts with a seed whereas the present applicant starts with nanostructures. However, examiner points out that applicant in pg. 2 of arguments filed 26 March 2011 concede that the prior art Banin reference, like the present application, is a solution growth method. The method as claimed in 68/73 do not differentiate from the prior art reference of Banin and in fact the prior art reference of Banin seems to fit perfectly. Secondly, in the arguments, applicant refers to order by referencing a starting/beginning point however there is really no order/beginning preventing the starting of the nanostructure from a seed as per the limitations in the method claims. The starting nanostructure in the present application has to be formed somehow? The method claims need to be amended accordingly.

The device claims are rejected over the new prior art reference of Natan while the previously used Mayer reference is not presently used.

Examiner believes that if the method claims are amended similar to the device claims with respect to two ends couple to nanozones then the method claims would be very close to allowance in view of an updated search.

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Examiner believes that the new prior art reference of Natan anticipates the device claims as presently claimed.

Applicant's arguments with respect to the device claims have been considered but are moot in view of the new grounds of rejection.

### *Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOHN P. DULKA whose telephone number is (571)270-7398. The examiner can normally be reached on Mon-Thurs: 7:30am-5:00pm; Fri: 7:30am-4:00pm. Every other Friday Off. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, N. Drew Richards can be reached on (571)-272-1736. The fax phone number for the organization where this application or proceeding is assigned is (571)-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or (571)-272-1000.

06/17/2011

/J. P. D./

Examiner, Art Unit 2895

/N. Drew Richards/

Supervisory Patent Examiner, Art Unit 2895